



CALTRANS EQUITY INDEX

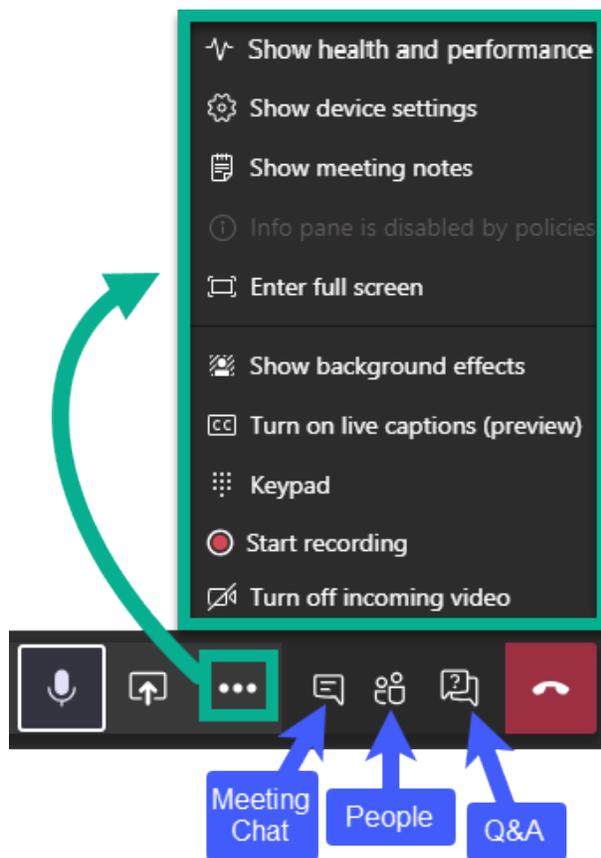
INFORMATION SESSION #3: METHODOLOGY & TECHNICAL DEVELOPMENT

April 25, 2023

PRESENTED BY: ALEXIS LANTZ, CAROLYN ABRAMS, AND HENRY MCKAY

*DIRECTOR'S OFFICE OF EQUITY, SUSTAINABILITY & TRIBAL AFFAIRS
CALIFORNIA DEPARTMENT OF TRANSPORTATION (CALTRANS)*

WEBINAR FUNCTIONS



- Recording
- Closed captions / live transcript
- Q&A
- Chat and participant list

AGENDA

1. Purpose and motivation for the Caltrans Equity Index
2. Equity Index Methodology and Technical Development
 - Demographic Overlay / Census Data
 - Traffic Exposure Indicators
 - Access to Destinations Indicators
 - Index Screens
 - Tracking
3. Development Timeline
4. Q&A



EXCERPT FROM CALTRANS EQUITY STATEMENT

Caltrans recognizes our leadership role and unique responsibility in State government to eliminate barriers **to provide more equitable transportation** for all Californians.

This understanding is the foundation for **intentional decision-making** that **recognizes past, stops current, and prevents future harms** from our actions.



EQI OBJECTIVES

- Identify indicators to account for equity-based outcomes
- Develop data-driven definition for underserved communities
- Assist in the evaluation and prioritization of the department's plans and projects

BETA EQI APPROACH

- Granularity
- Spatially-significant indicators
 - Some equity issues may not be spatial
- Focus on issues affected by transportation decisions
- Avoid double counting indicators

BETA EQI INDICATORS

Transportation Burdens

- Truck-weighted traffic proximity and volume
- Crash exposure

Transportation Benefits

- Access to work destinations
- Access to nonwork destinations

Demographics

- Household income
- Race/ethnicity

DEMOGRAPHIC OVERLAY

Demographic Indicator

- Household Income

Proposed threshold: $\leq 80\%$ of the statewide median household income OR \leq HCD county low-income threshold (AB 1550)

AND/OR

- Race and Ethnicity Data

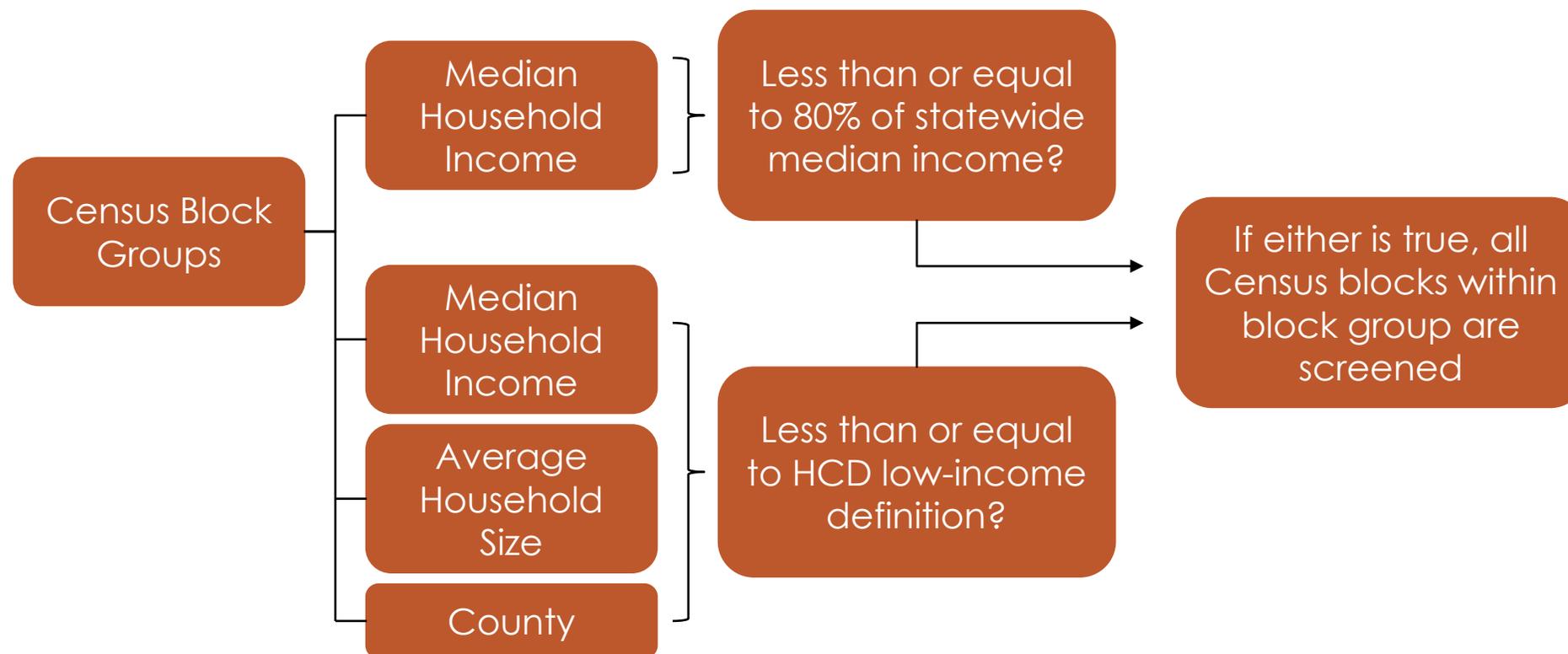
Proposed threshold: $\geq 63\%$ non-white (statewide %)

HOUSEHOLD INCOME

AB 1550 Low Income Communities Definition

- *“Low-income communities” are census tracts with median household incomes at or below 80 percent of the statewide median income or with median household incomes at or below the threshold designated as low income by HCD’s State Income Limits adopted pursuant to Section 50093.”*
- The EQI operationalizes this definition for all Census blocks in the state

HOUSEHOLD INCOME



RACE AND ETHNICITY

EQI Threshold

- “Greater than or equal to 63.4902% non-white” (statewide %)
- Threshold was previously 50% and was raised after receiving feedback from our partners

DATA CONSIDERATIONS

Income

- Income calculations are performed on the block group level using ACS 5-year estimates and interpolated to the block level

Race and Ethnicity

- Race/ethnicity data is calculated on the block level (decennial Census) and block group (ACS) levels
- Block-level decennial data provides granularity while ACS block group data is updated more frequently

TRAFFIC EXPOSURE

Traffic Exposure Indicators

- Traffic Proximity and Volume

Proposed threshold: \geq 80th percentile for truck-weighted traffic proximity and volume exposure

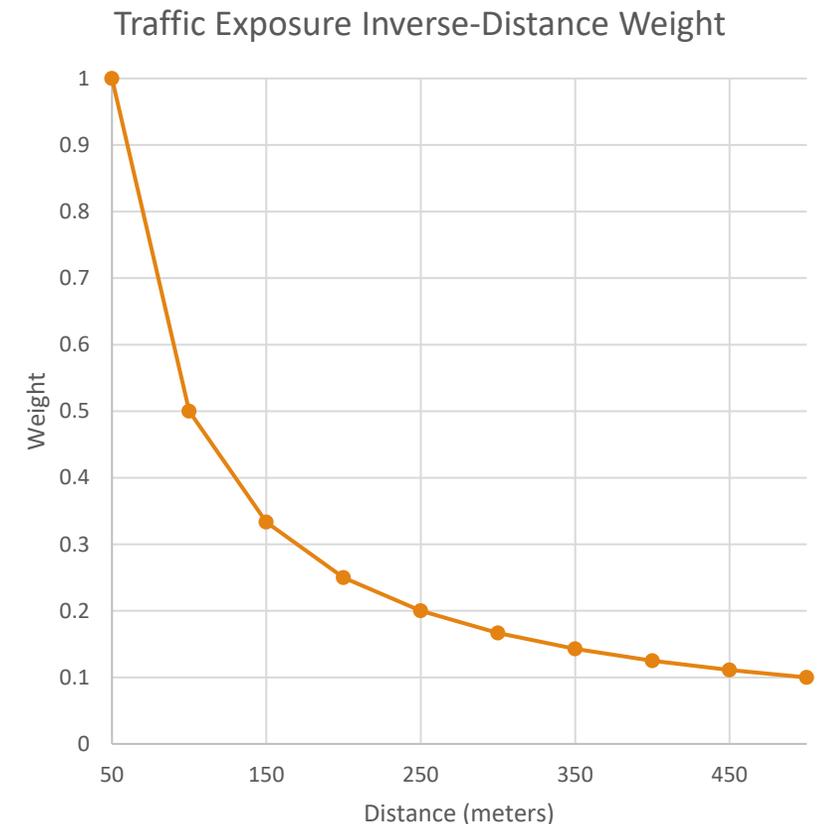
OR

- Crash Exposure Data

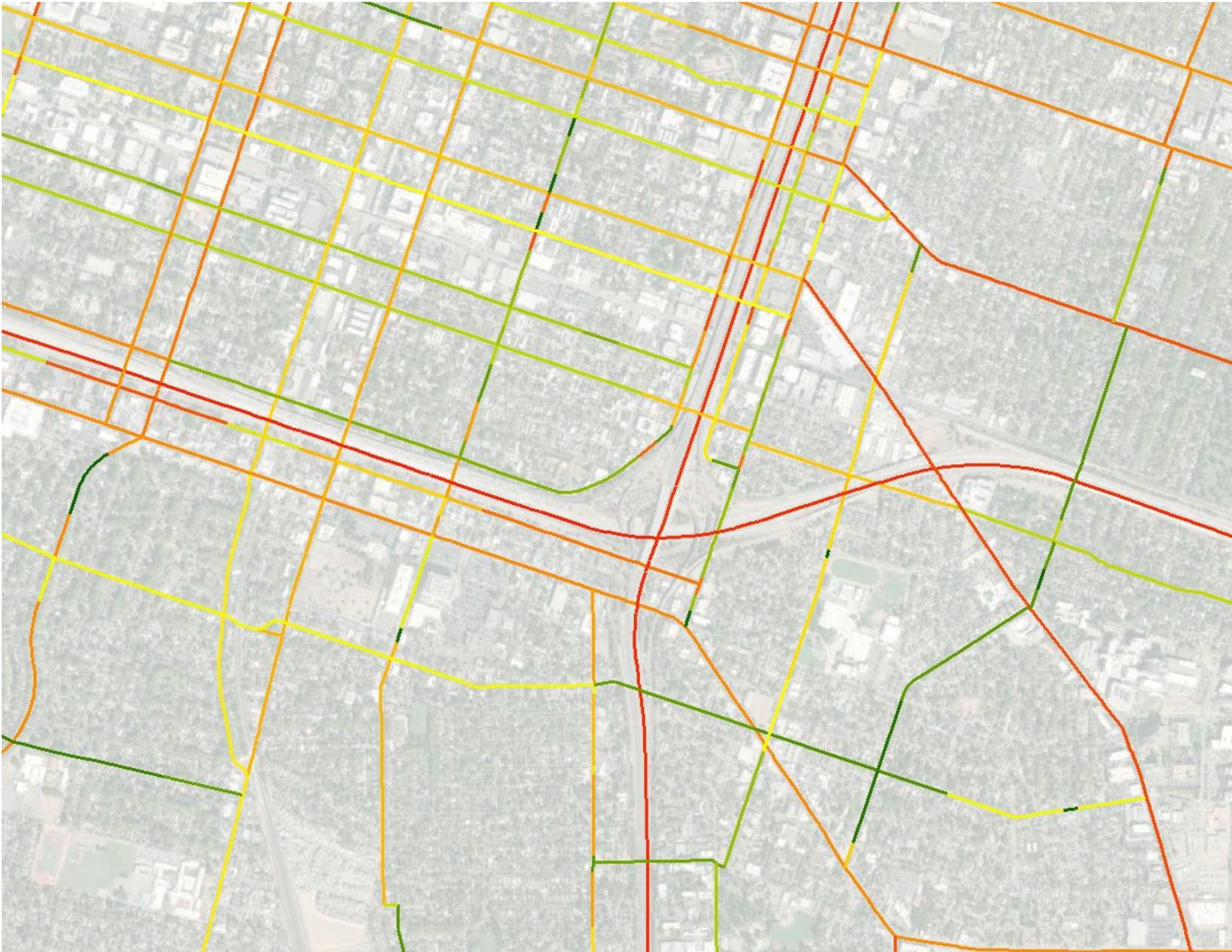
Proposed threshold: \geq 80th percentile for weighted crash exposure

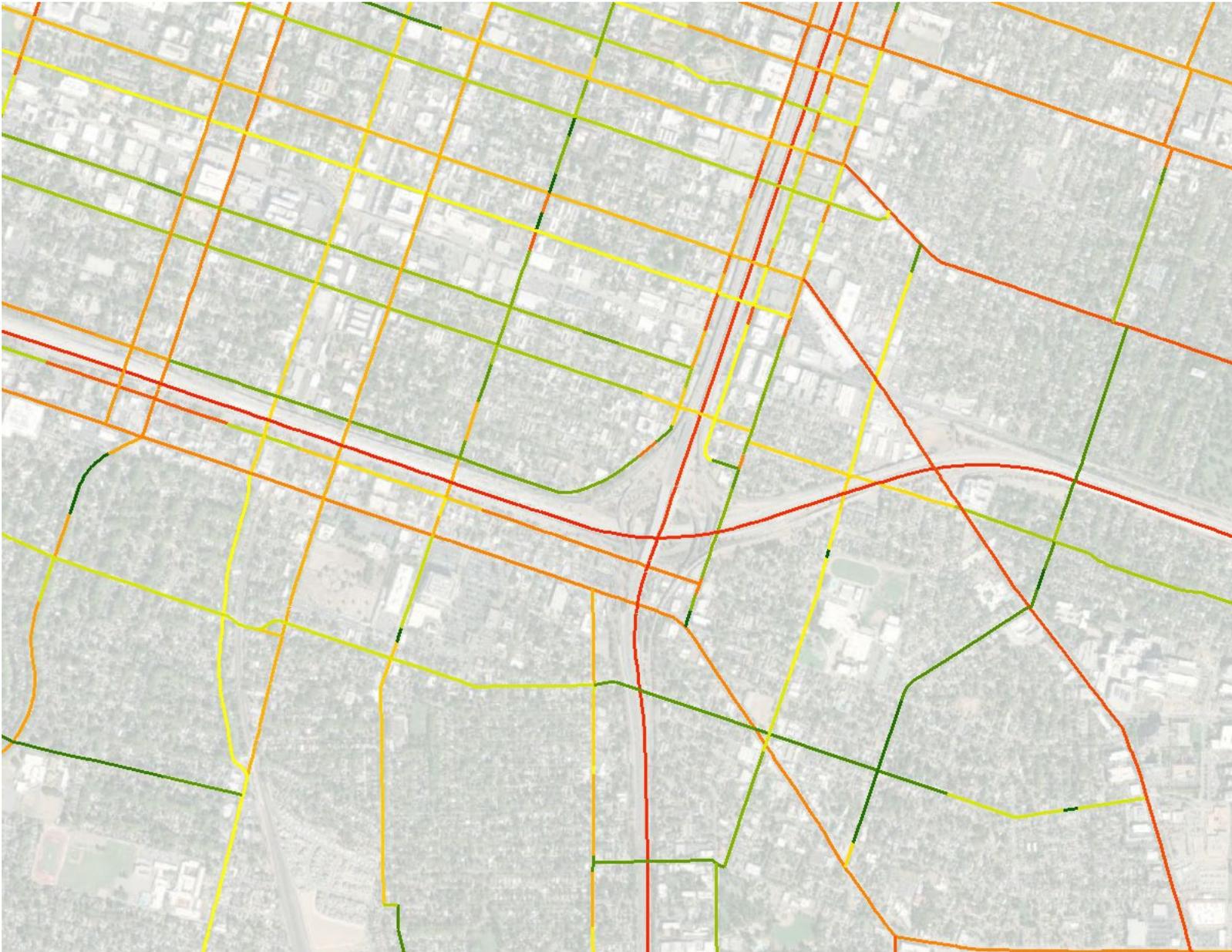
TRAFFIC PROXIMITY AND VOLUME

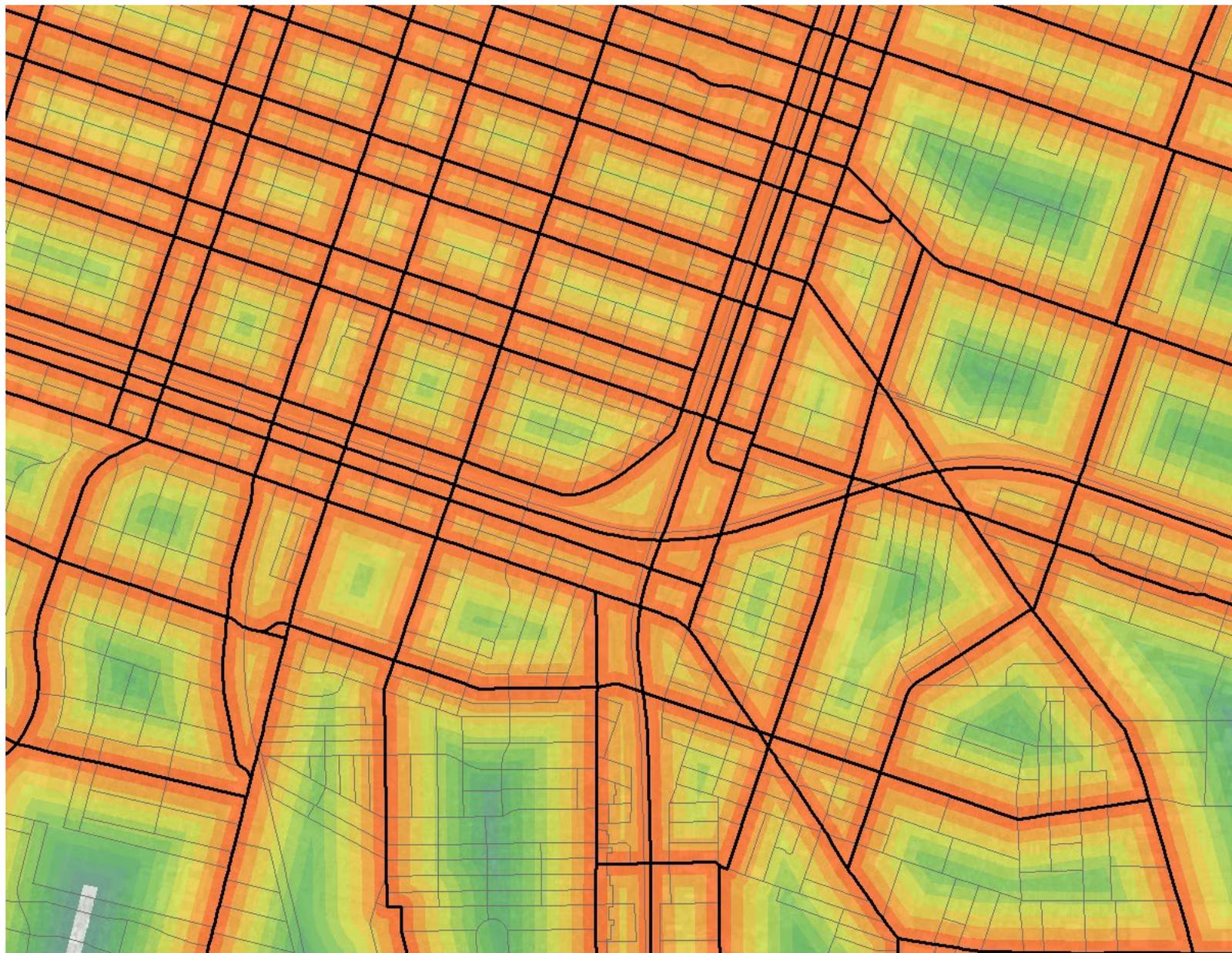
- Highway Performance Monitoring System (HPMS) input data
- Buffer from centerline and intersect with blocks
- Inverse-distance decay weighting
- Impact measured as truck-weighted Annual Average Daily Traffic (AADT)
- Truck traffic is weighted 6X heavier than car traffic (based on exhaust PM 2.5 rates)

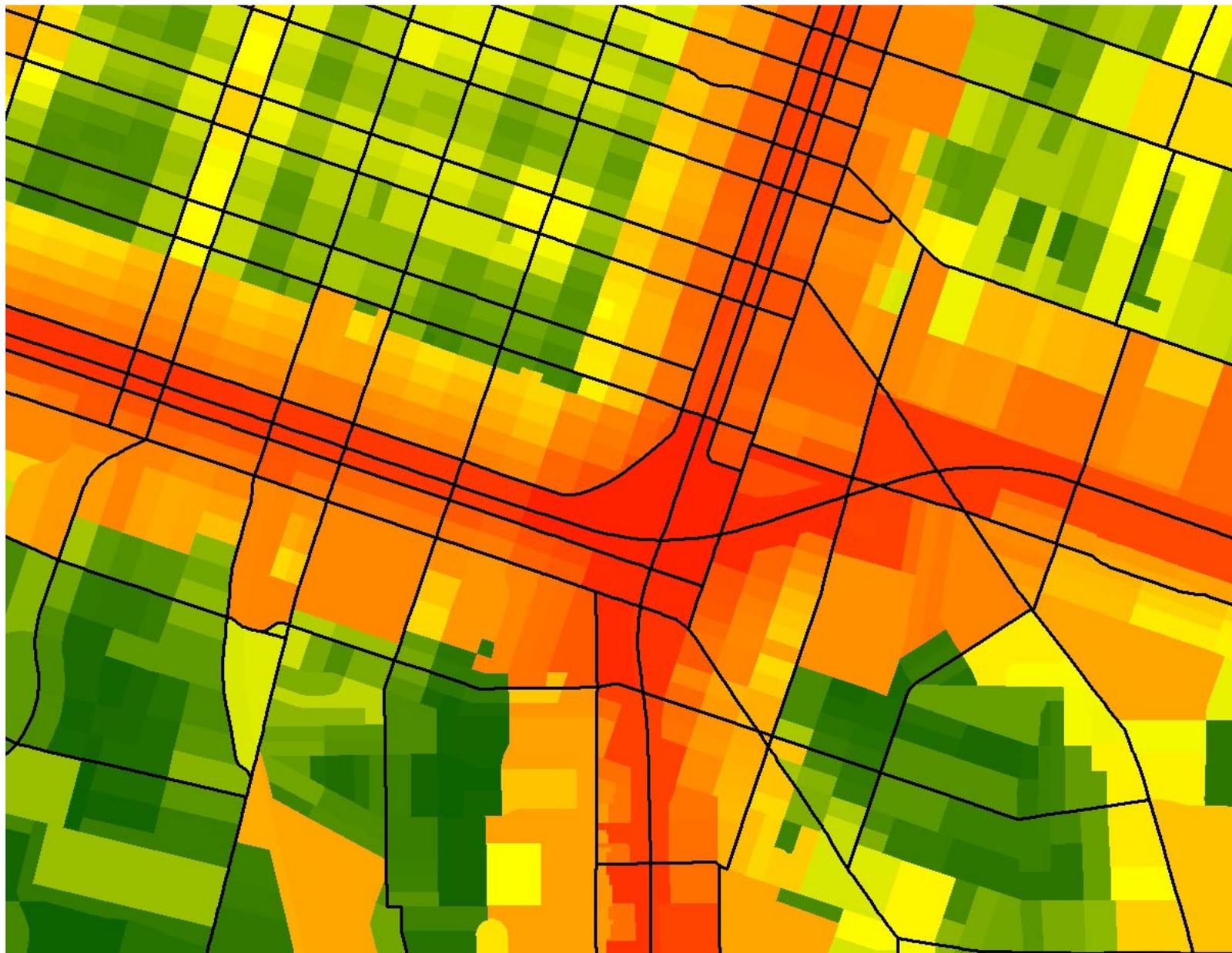


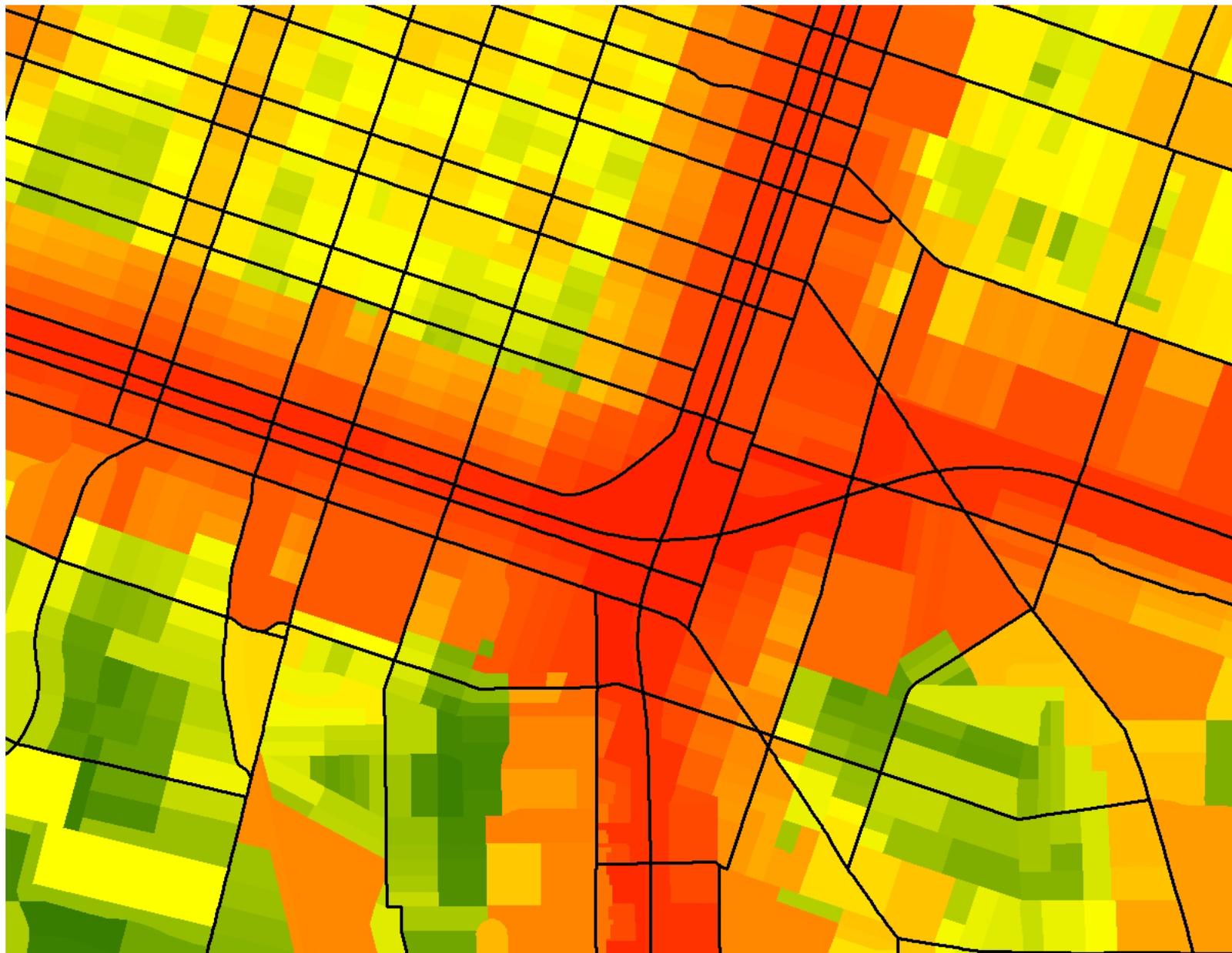






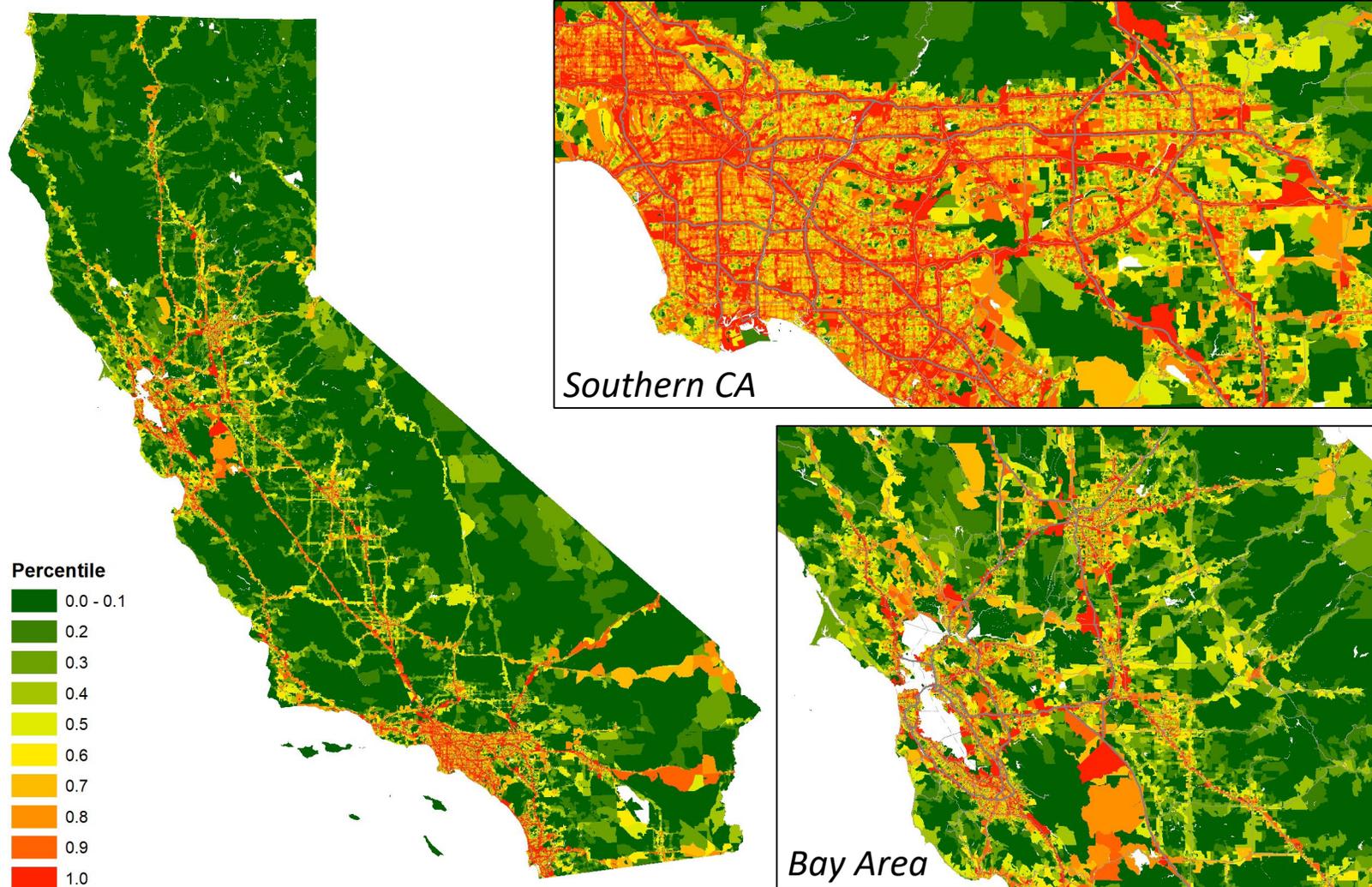






Traffic Exposure

Traffic Proximity and Volume



PROJECT EVALUATION

For a given project, various resources can be used to determine the impact on traffic:

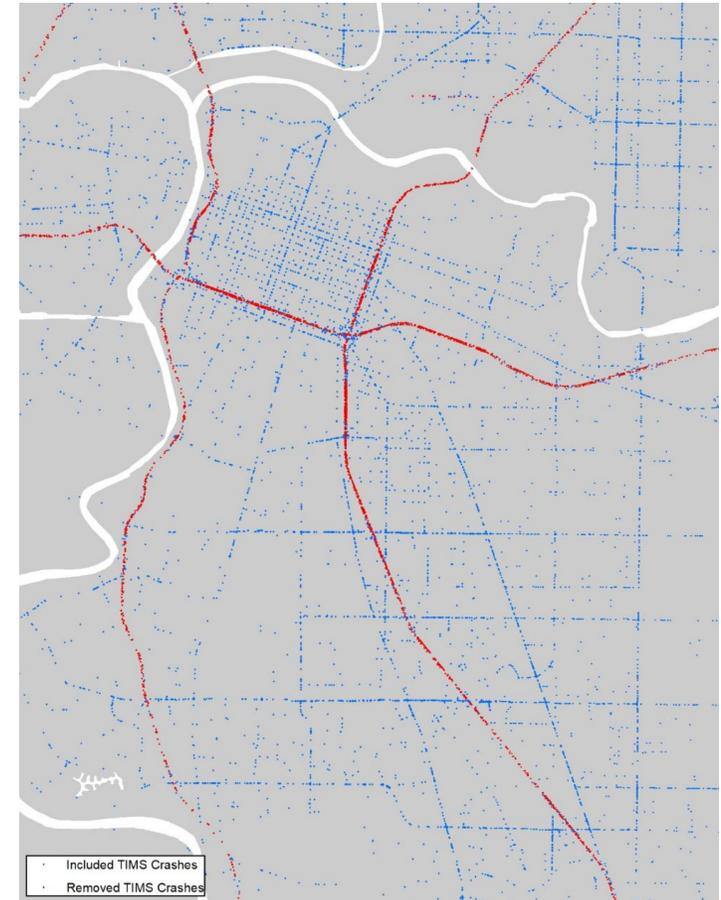
- Traffic Operations Analysis Report (TOAR)
- NCST Calculator
- Other Models

Other projects may not alter traffic levels, but could mitigate the externalities of traffic

- Soundwalls, air filtration

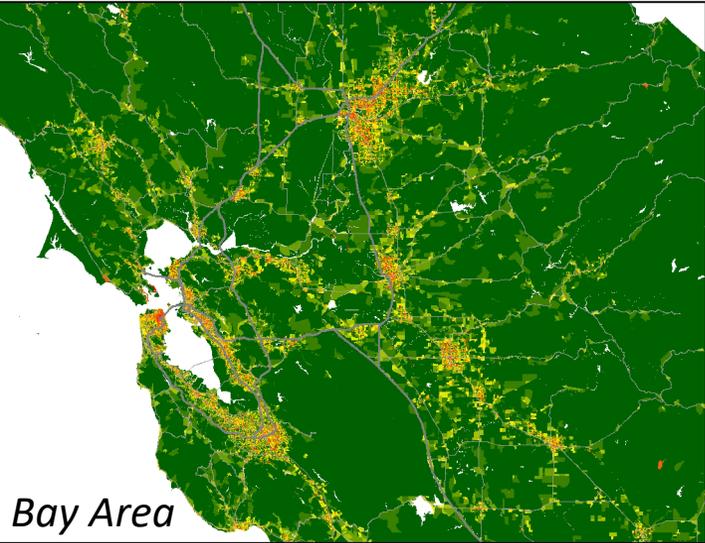
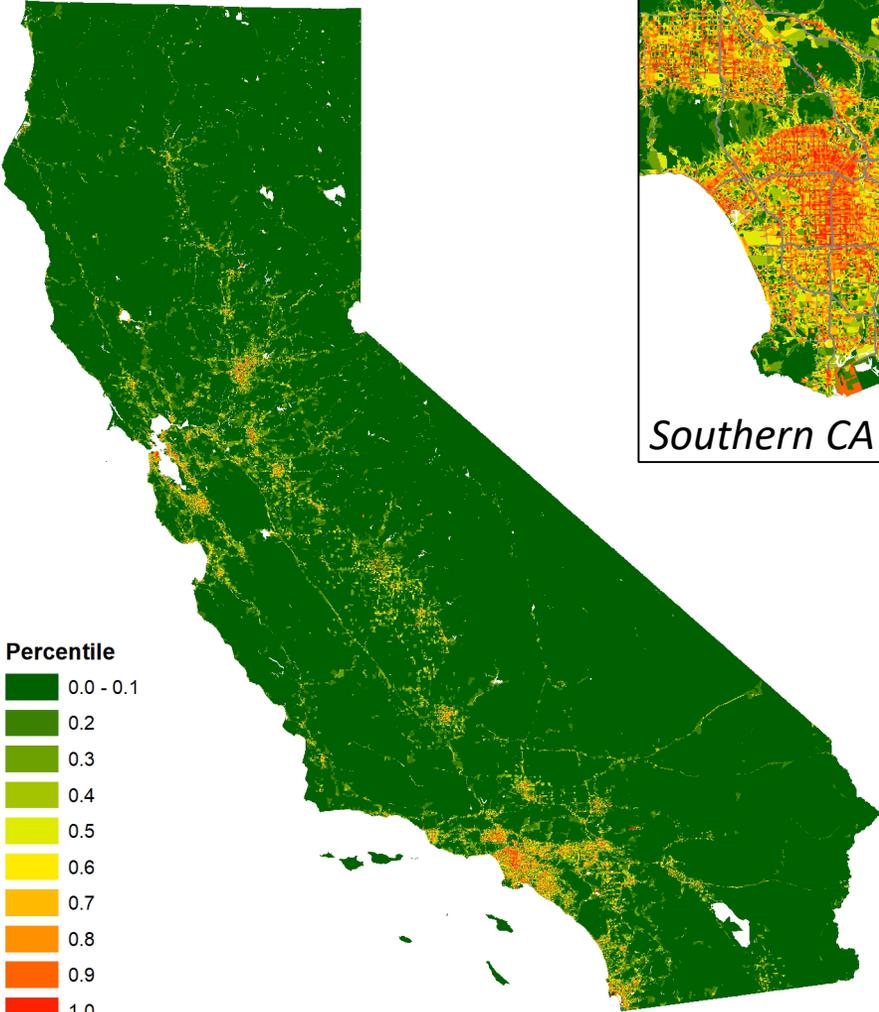
CRASH EXPOSURE

- Transportation Injury Mapping System (TIMS) Input data (derived from SWITRS)
- Crashes on controlled-access facilities removed
- Crashes weighted by severity (Cal BCA)
 - *Injury (minor): 1, Injury (moderate): 1.96, Injury (severe): 7.19, Fatality: 157.97*
- Weighted crashes summed within 250-foot buffer of block



Traffic Exposure

Crash Exposure



PROJECT EVALUATION

- For a given project, safety impacts can be analyzed
- Project-level impact metrics still under development
- Broadly speaking, a project could improve safety by:
 1. Installing safety countermeasures
 2. Reducing the amount of driving (reducing VMT)

ACCESS TO DESTINATIONS

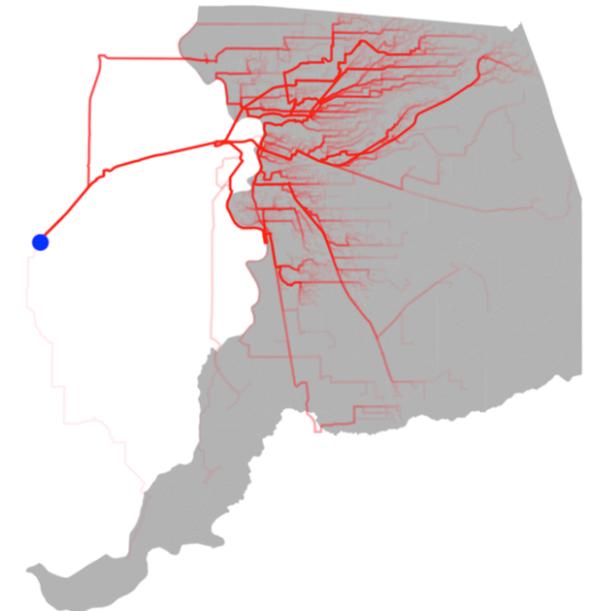
Access to Destinations Indicators

- Ratio of multimodal access (transit & walking) to auto access
Proposed threshold: < 0.2 for both work and non-work destinations
- 'Ideal Access' analysis (still under development)
Will be used to develop screens for bicycle access, accounting for Level of Traffic Stress (LTS) and circuitry barriers

ACCESS TO DESTINATIONS

- Access calculated using Open Street Map (OSM) + General Transit Feed Specification (GTFS) networks
- Cumulative opportunities metric used
- Opportunities decay-weighted
- Calculated statewide using 200-meter grid cells

$$A_i = \sum_j O_j f(C_{ij})$$





EMPLOYMENT DESTINATIONS

- 2019 LODS data
- All NAICS sectors included
- Non-competitive access metric used
- Work from home implications

NAICS Sector
Agriculture, Forestry, Fishing and Hunting
Mining, Quarrying, and Oil and Gas Extraction
Utilities
Construction
Manufacturing
Wholesale Trade
Retail Trade
Transportation and Warehousing
Information
Finance and Insurance
Real Estate and Rental and Leasing
Professional, Scientific, and Technical Services
Management of Companies and Enterprises
Administration & Support, Waste Management and Remediation
Educational Services
Health Care and Social Assistance
Arts, Entertainment, and Recreation
Accommodation and Food Services
Other Services (excluding Public Administration)
Public Administration

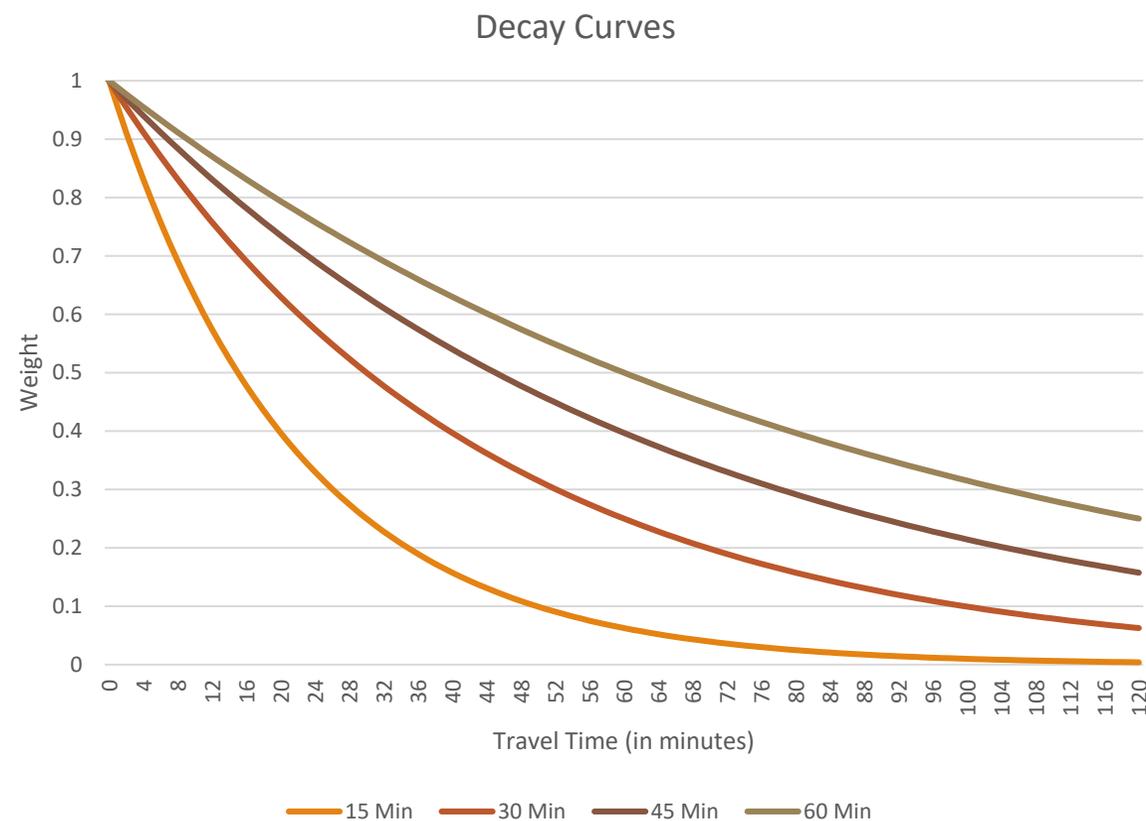
NON-WORK DESTINATIONS

Category	Destination Type	Status
City Hall	Public Service	Core
Civic/Community Centre	Public Service	Core
Court House	Public Service	Core
Government Office	Public Service	Core
Grocery Store	Grocery	Core
Higher Education	Education	Core
Hospital	Healthcare	Core
Library	Public Service	Core
Medical Service	Healthcare	Core
Park/Recreation Area	Recreation	Core
Pharmacy	Healthcare	Core
Post Office	Public Service	Core
School	Education	Core

Category	Destination Type	Status
ATM	Bank	Other
Bank	Bank	Other
Bookstore	Shopping	Other
Clothing Store	Shopping	Other
Coffee Shop	Food & Drink	Other
Consumer Electronics Store	Shopping	Other
Convenience Store	Shopping	Other
Department Store	Shopping	Other
Home Improvement & Hardware Store	Shopping	Other
Home Specialty Store	Shopping	Other
Office Supply & Services Store	Shopping	Other
Petrol/Gasoline Station	Shopping	Other
Place of Worship	Other	Other
Restaurant	Food & Drink	Other
Shopping	Shopping	Other
Specialty Store	Shopping	Other
Sporting Goods Store	Shopping	Other

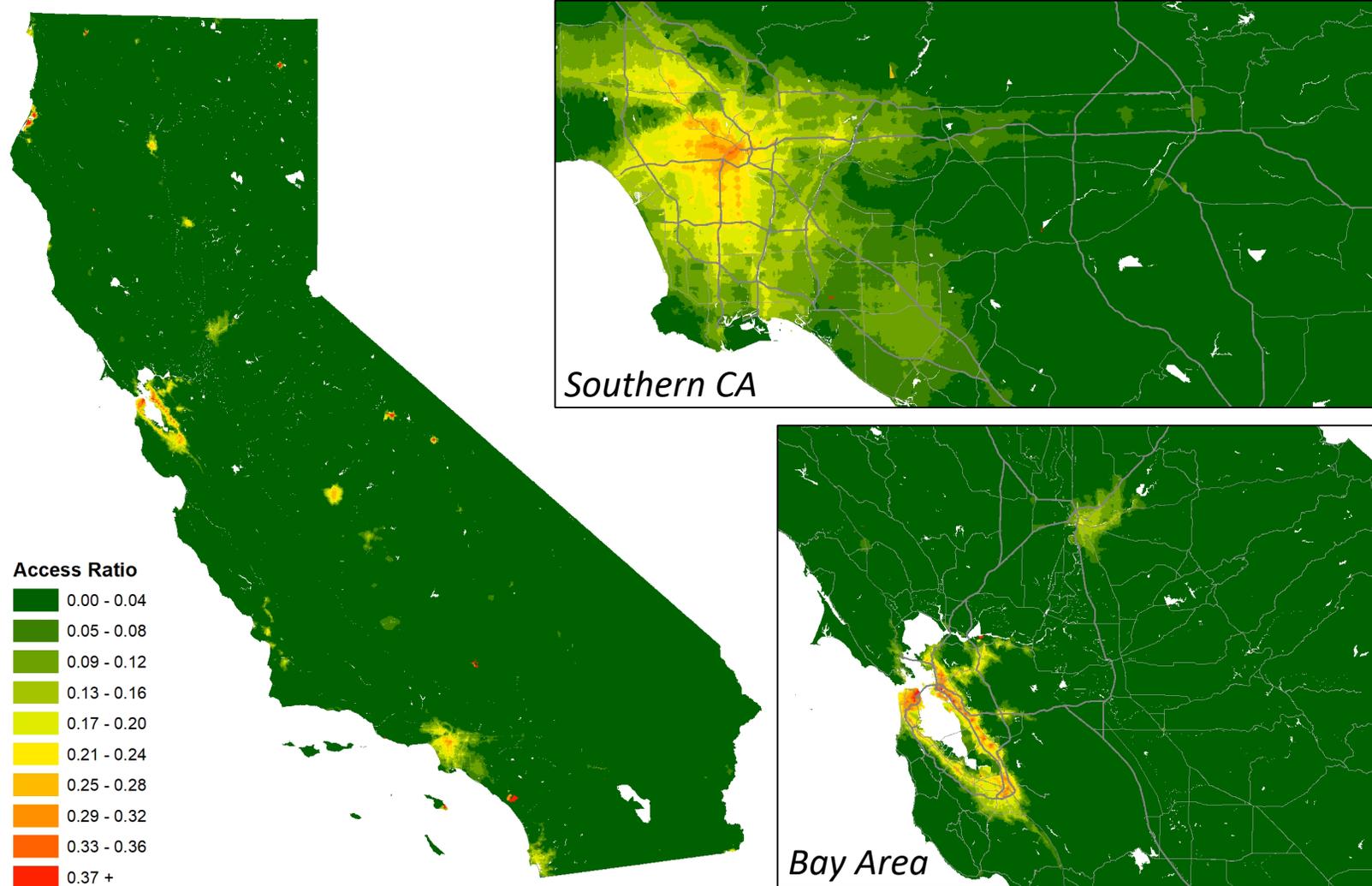
TRAVEL TIME DECAY

- Cumulative opportunities are weighted by travel time
- Decay functions can be calibrated to reflect travel behavior



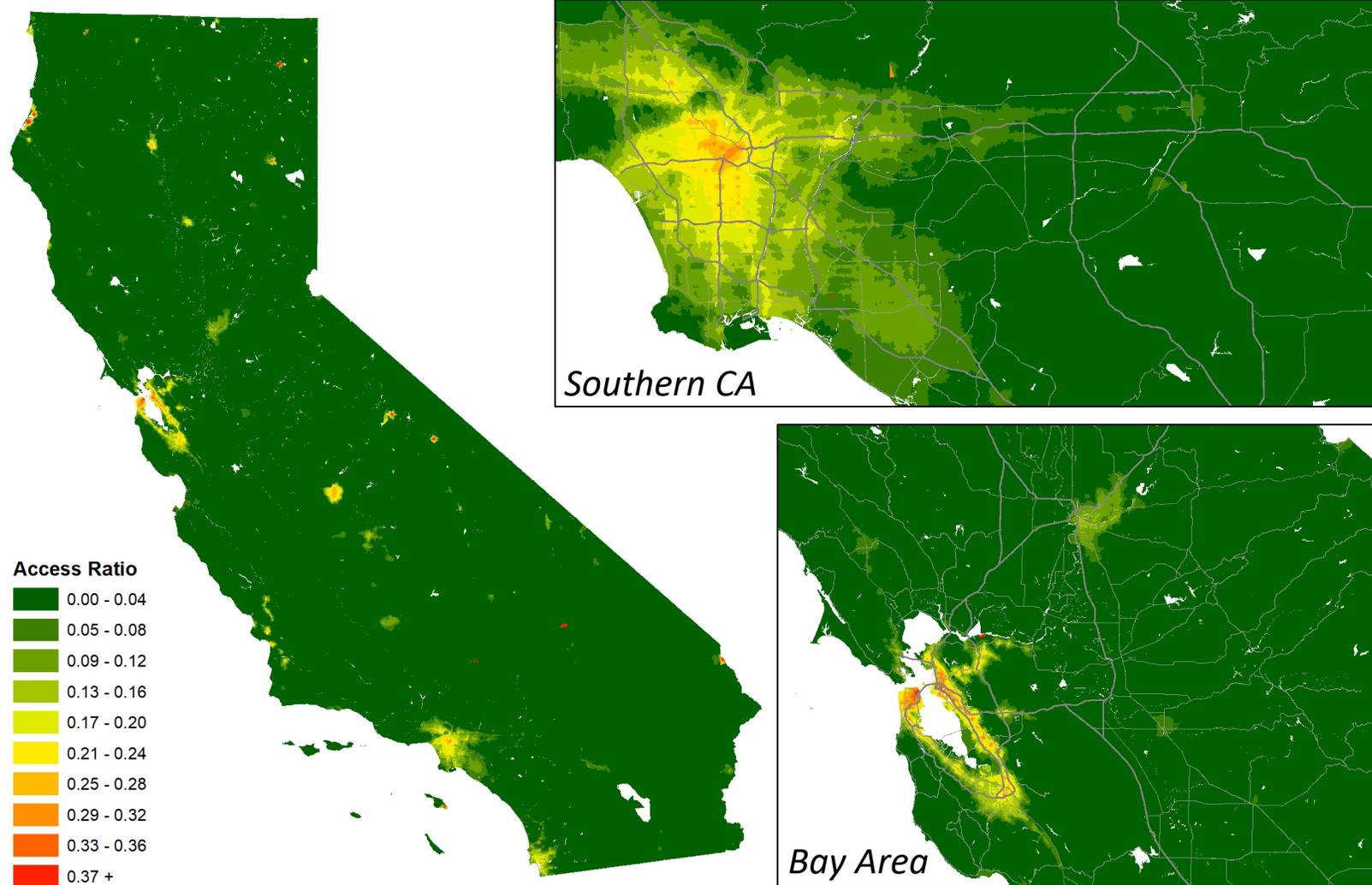
Access to Destinations

Work Access



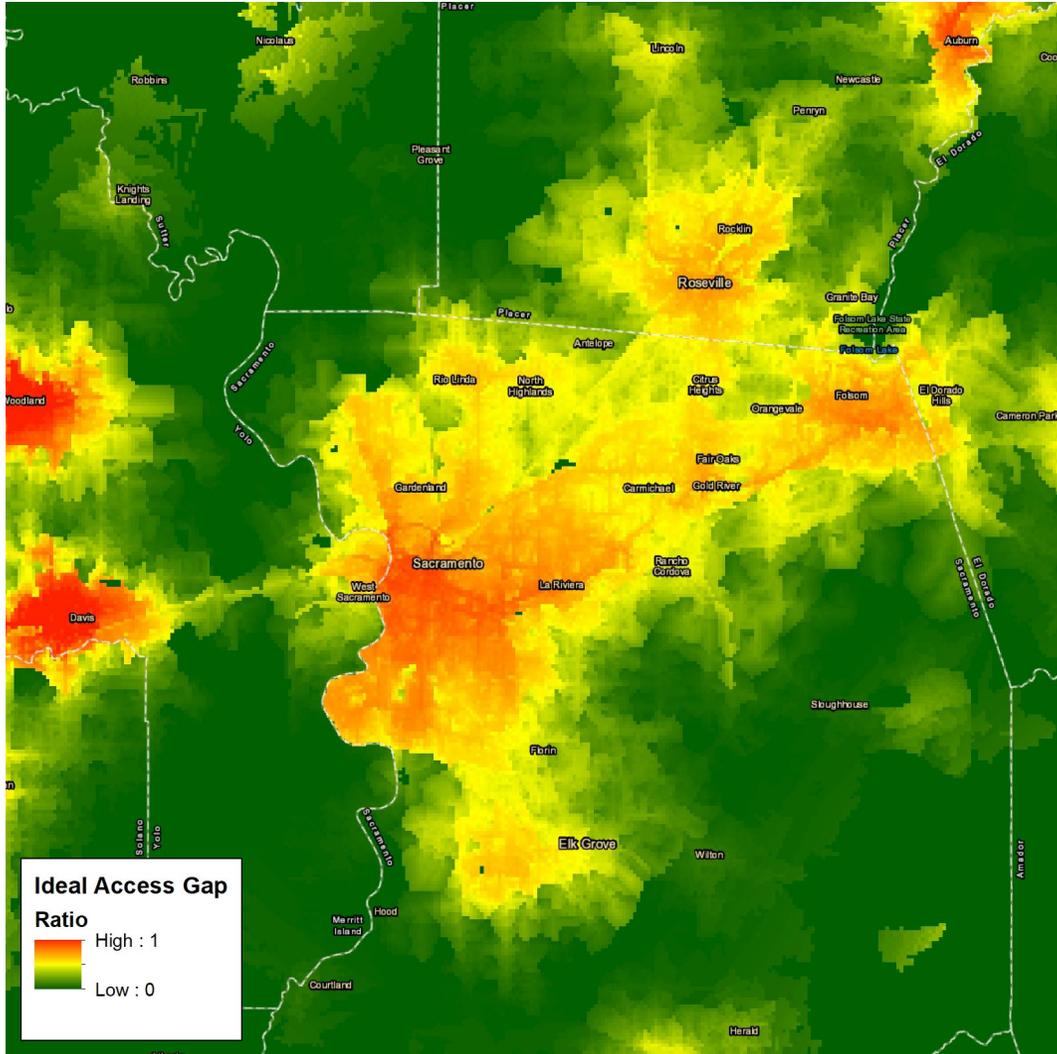
Access to Destinations

Non-Work Access



Access to Destinations

'Ideal Access' metric (under development)



- Designed for use in evaluating bicycle access to destinations
- Compares access with existing network to access under ideal conditions where the network isn't a constraint
- Identifies gaps in the network explainable by both:
 - Level of Traffic Stress (LTS)
 - Circuity

LEVEL OF TRAFFIC STRESS



LTS 1

comfortable for all
ages and abilities



LTS 2

comfortable for most
adults



LTS 3

comfortable for
confident bicyclists

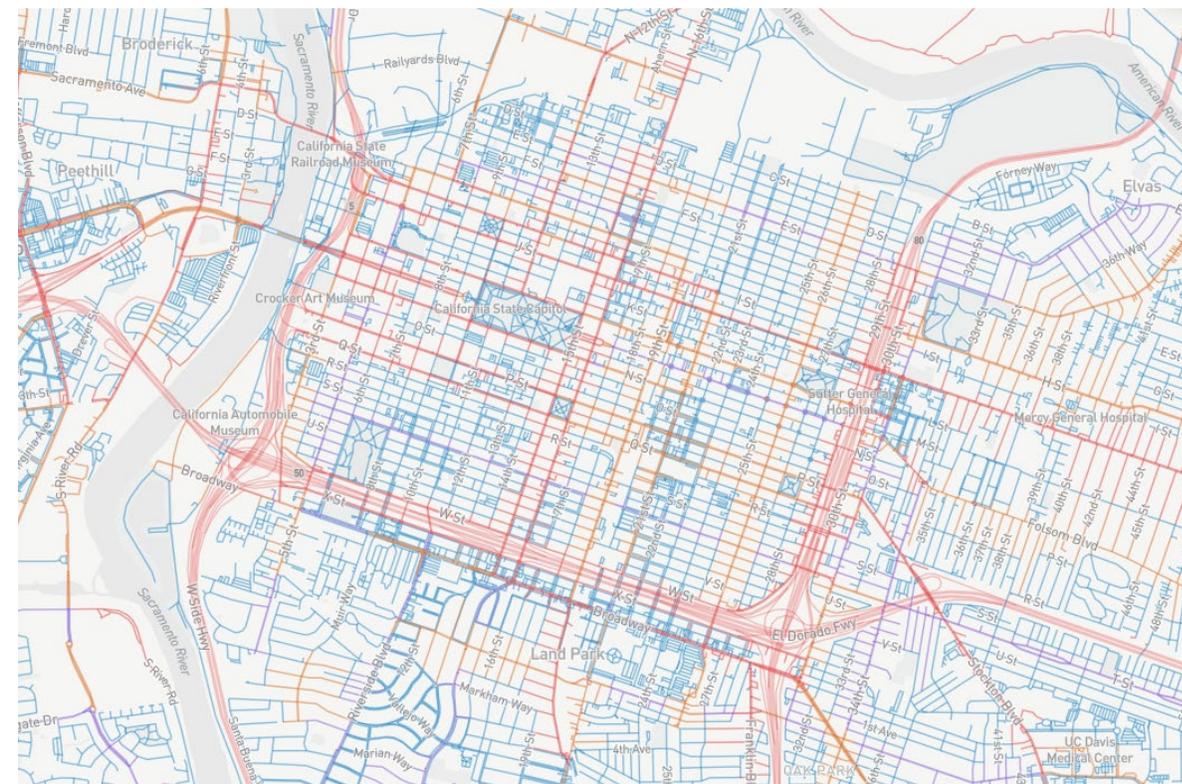


LTS 4

uncomfortable for
most

LEVEL OF TRAFFIC STRESS

- For analysis purposes, a specific LTS threshold is set
- If that threshold is exceeded during the routing process, the trip reverts from bike speed to walk speed
- Can also be operationalized as generalized cost



PROJECT EVALUATION

- Caltrans is operationalizing accessibility analysis within the department to quantify project-level impacts

Conveyal Post-Processing Tool | Project Analysis | Map

Project Name
SacRT 15-Minute Network Expansion

Upload Conveyal Outputs

Baseline Conveyal .TIFF Output
Browse... BASELINE_jobs.tiff
Upload complete

Project Conveyal .TIFF Output
Browse... BUILD_jobs.tiff
Upload complete

Weight .TIFF
Browse... WORKERS.tiff
Upload complete

Project Extent Shapfile
Browse... 7 files
Upload complete

Analysis Area Buffer (kilometers)
20
Export CSV

Show 10 entries Search:

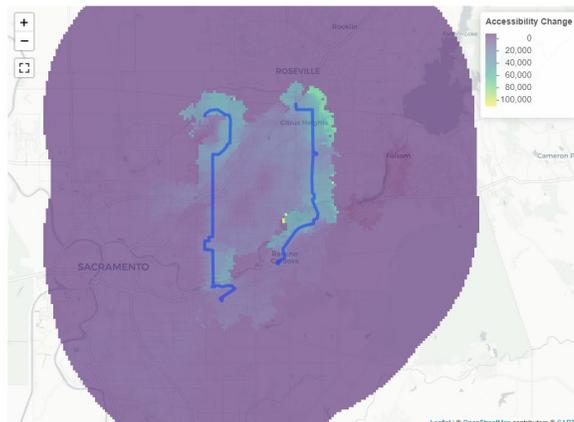
project	pct_change_access	pct_change_access_weighted	avg_change_access	weighted_avg_change_access
SacRT 15-Minute Network Expansion	3.82%	4.01%	2,627.89	5,643.66

Showing 1 to 1 of 1 entries Previous 1 Next

Conveyal Post-Processing Tool | Project Analysis | Map

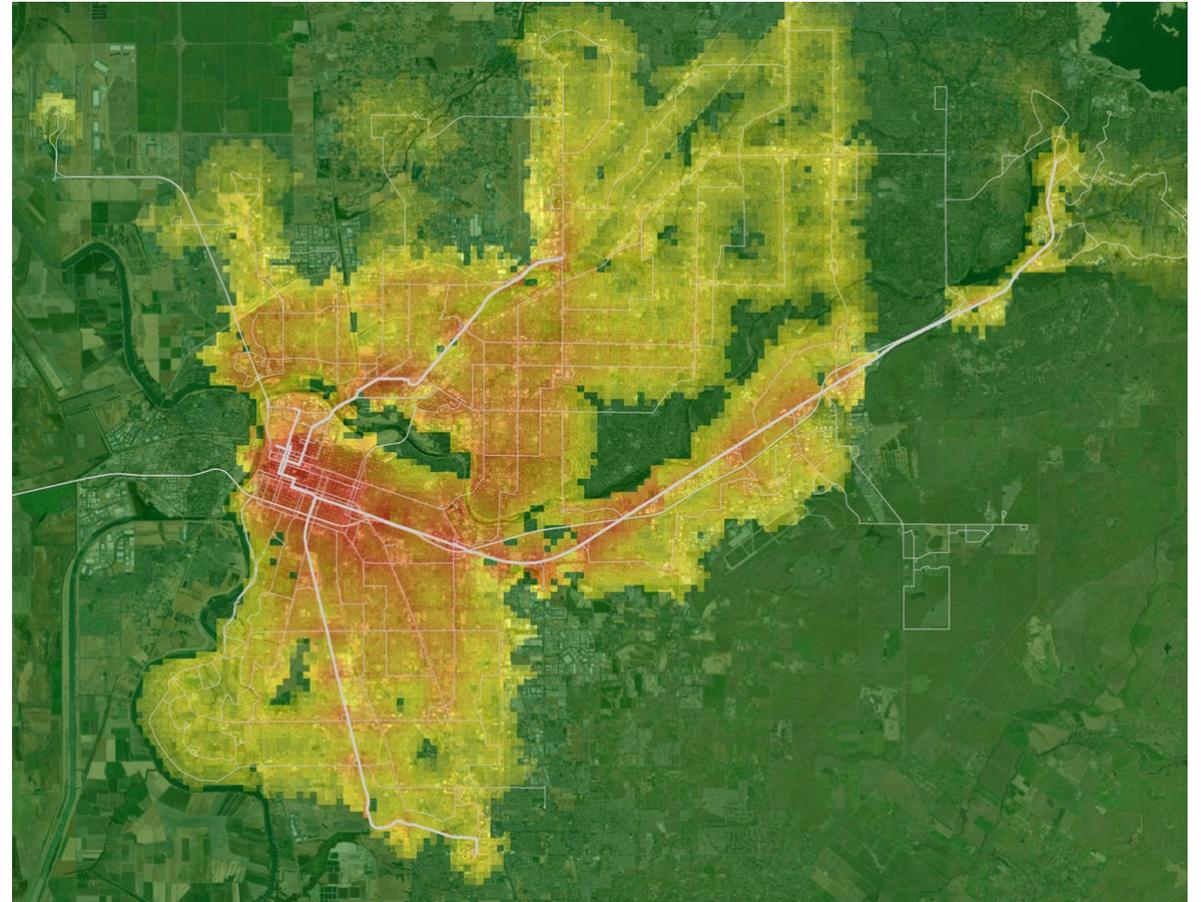
Select Raster to Map
Accessibility Change

Note: The weighted accessibility change map is meant only to show where the relative changes in accessibility occur when accounting for a weighting factor, using a color scale. Individual numbers associated with these changes should only be analyzed in the context of aggregate metrics, such as the ones shown on the project analysis tab.



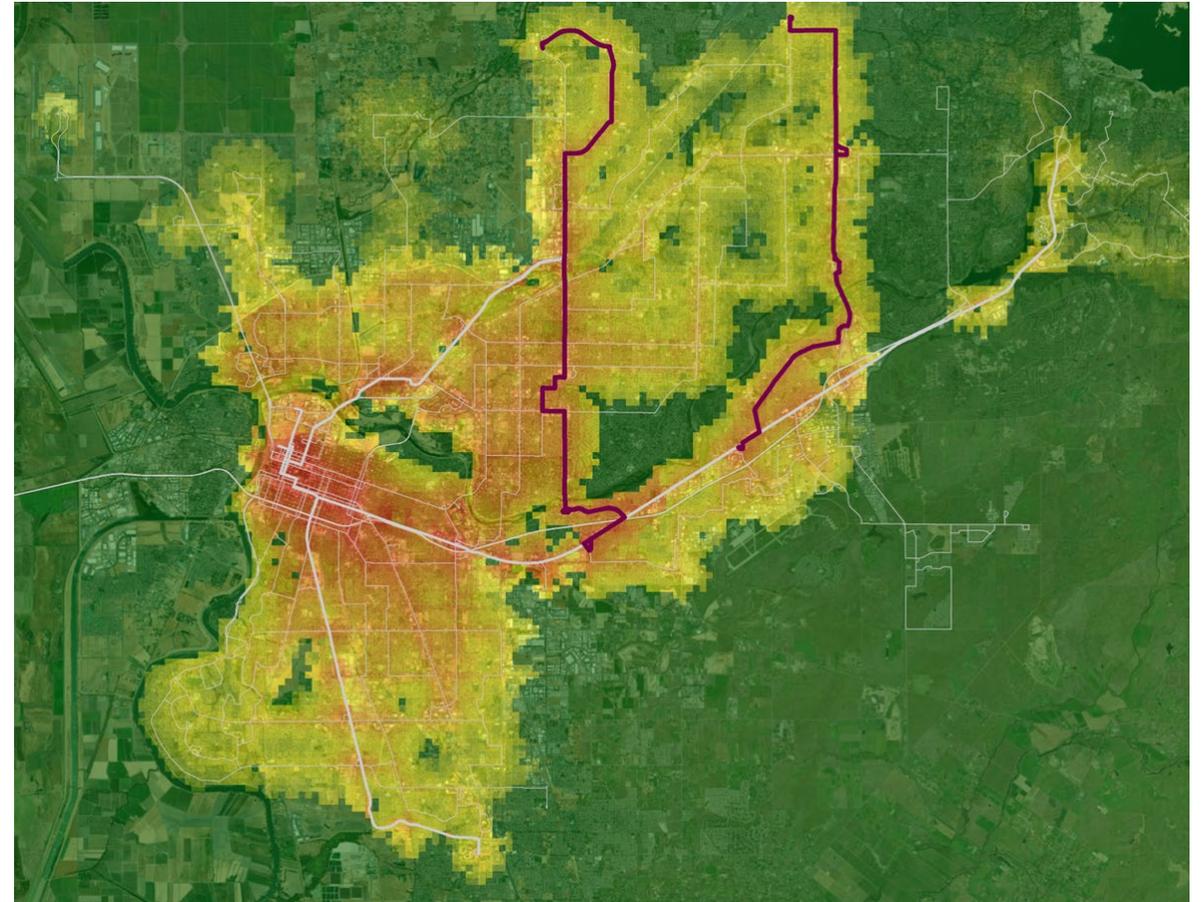
BASELINE

- Current SacRT Schedule
- Weekday Morning



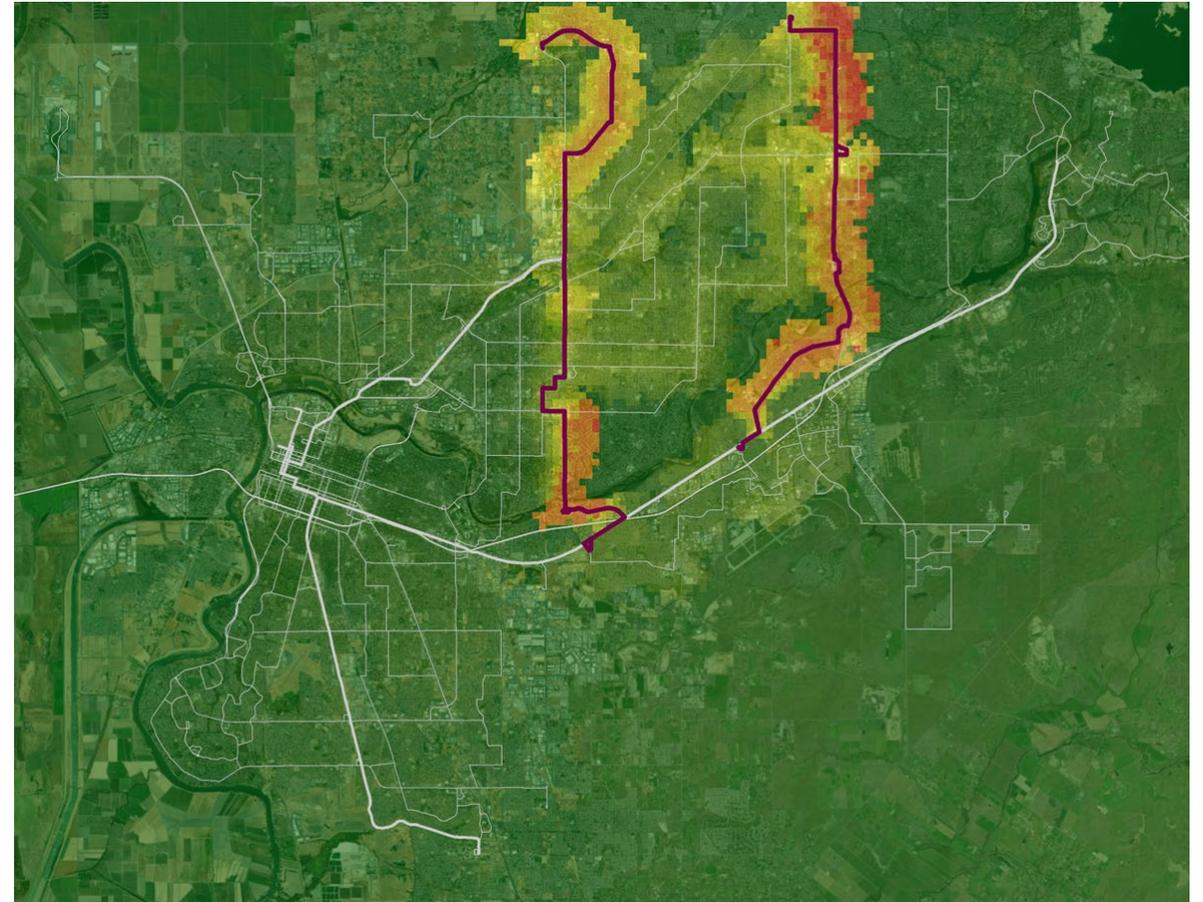
BUILD

- Same as previous, except...
- Converted routes 84 (Watt) and 21 (Sunrise) to 15-minute frequencies (previously 30-minute frequencies)



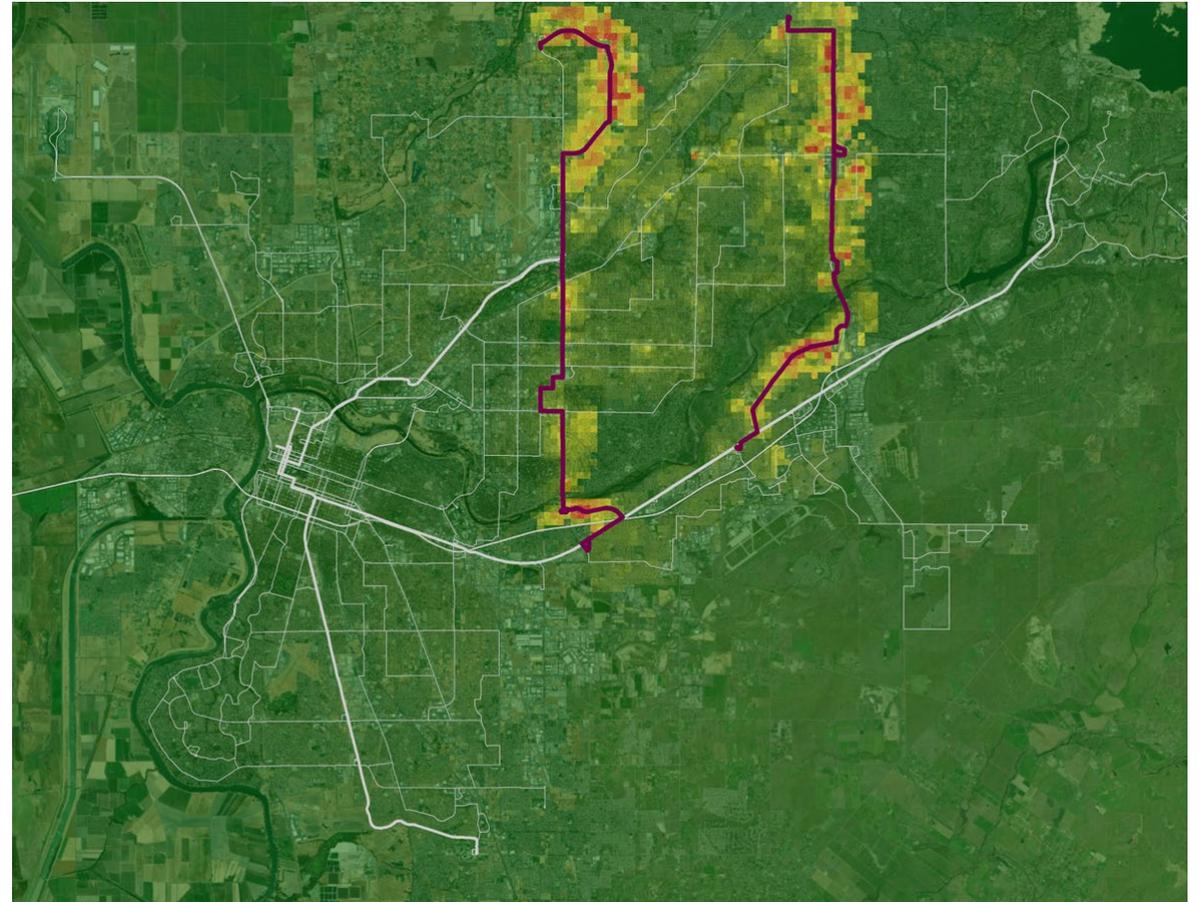
DIFFERENCE

- Largest gains in job accessibility occur along upgraded bus routes



DIFFERENCE (WORKER WEIGHTED)

- Worker-weighted accessibility accounts for worker residential location



METRICS

How do we quantify accessibility changes in the aggregate?

Project	% Increase in Job Accessibility	% Increase in Job Accessibility (worker-weighted)	Avg. Change in Job Accessibility	Avg. Change in Job Accessibility (worker-weighted)
SacRT 15-Minute Network Expansion	5.74%	5.81%	623	613

EQI SCREENS

Demographic Overlay

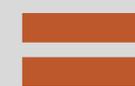
Transportation Indicators

EQI Screens

Demographic
Overlay



Traffic Proximity and Volume
OR Crash Exposure

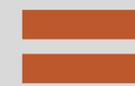


Traffic Exposure
Screen

Demographic
Overlay



Access to Destinations

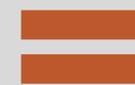


Access to Destinations
Screen

Demographic
Overlay



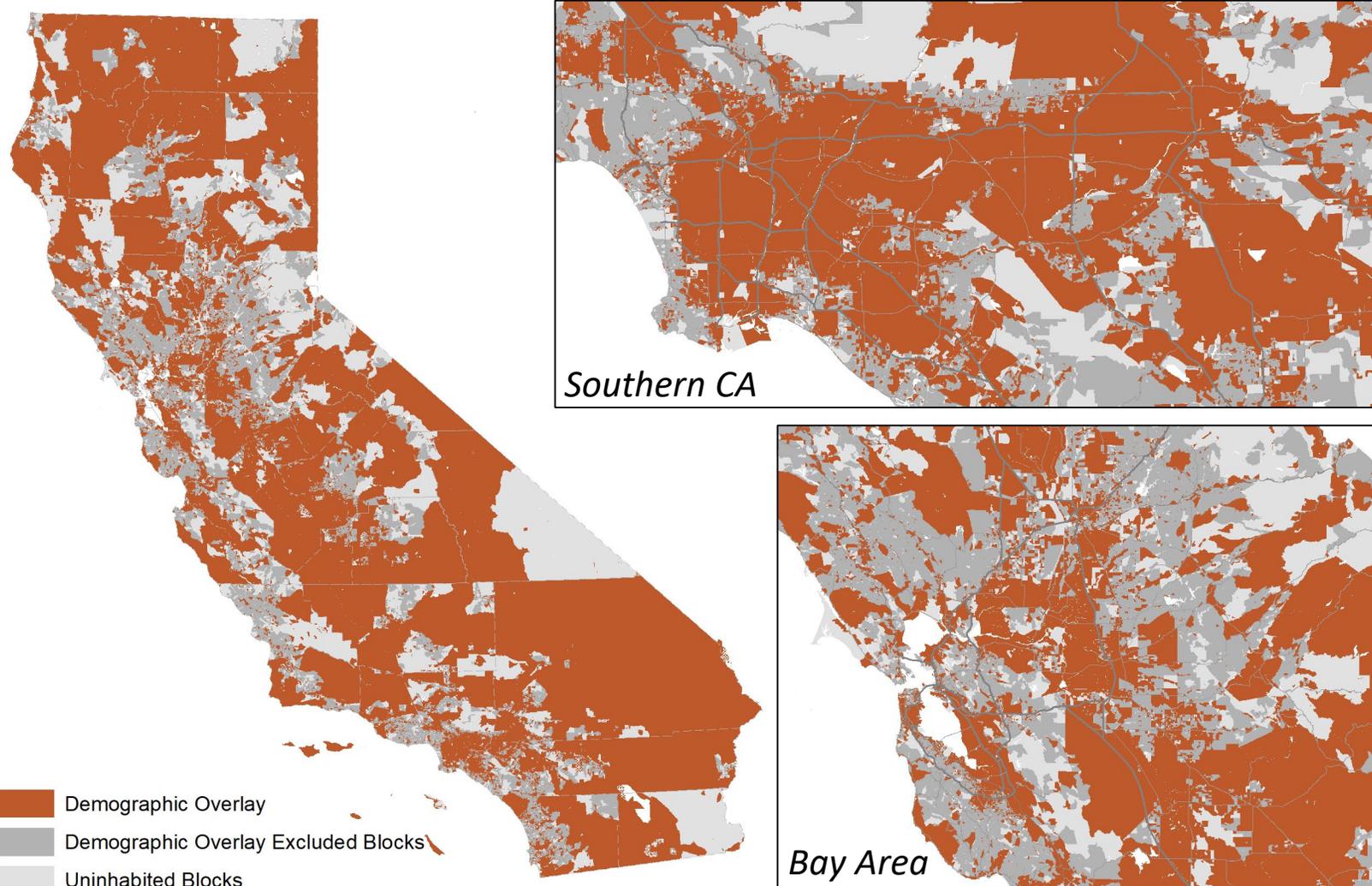
Traffic Proximity and Volume
OR Crash Exposure AND
Access to Destinations



Priority Populations
Screen

Demographic Overlay

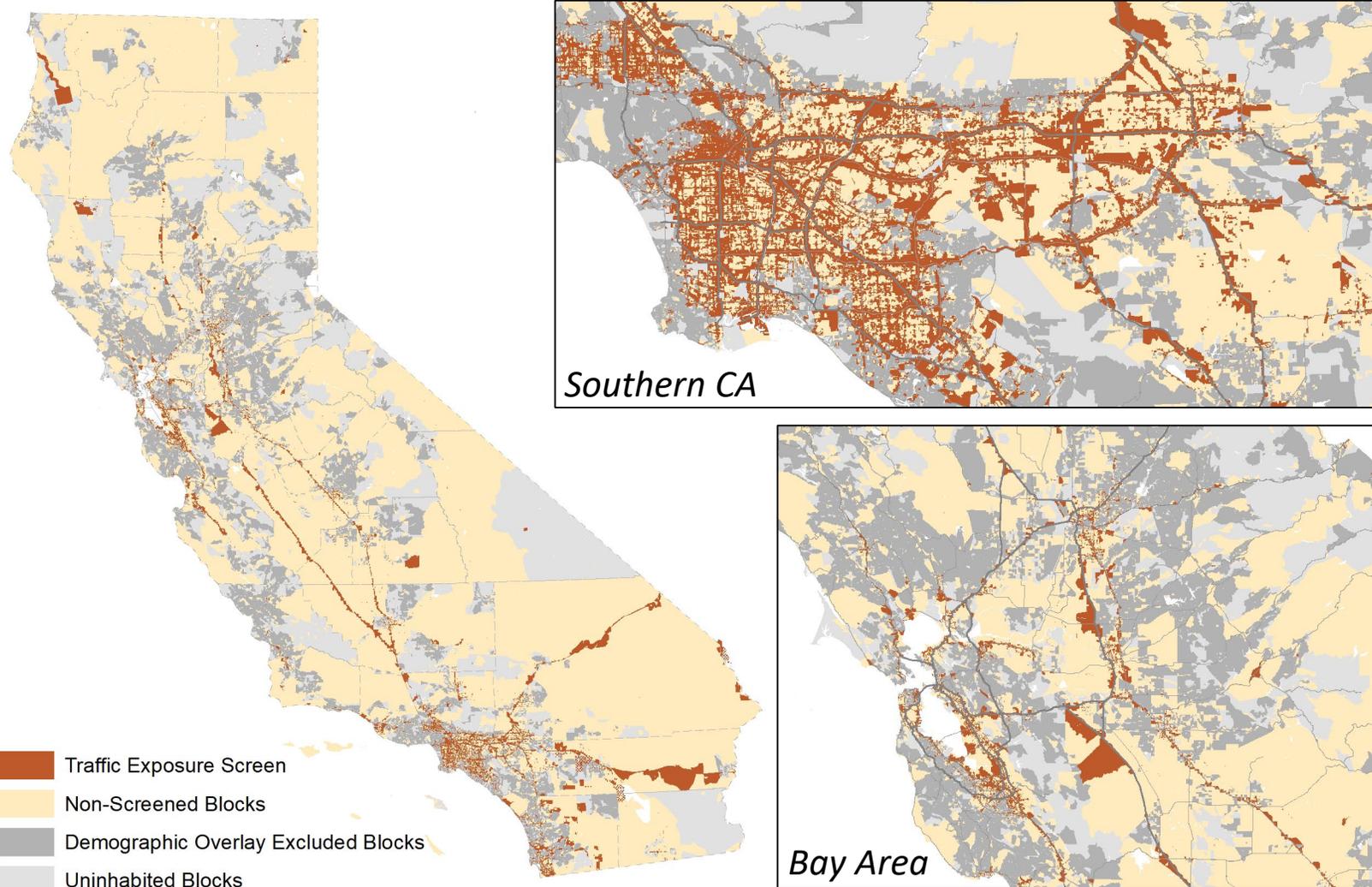
Total Population Coverage: **71%**



Household Income
OR
Race/Ethnicity

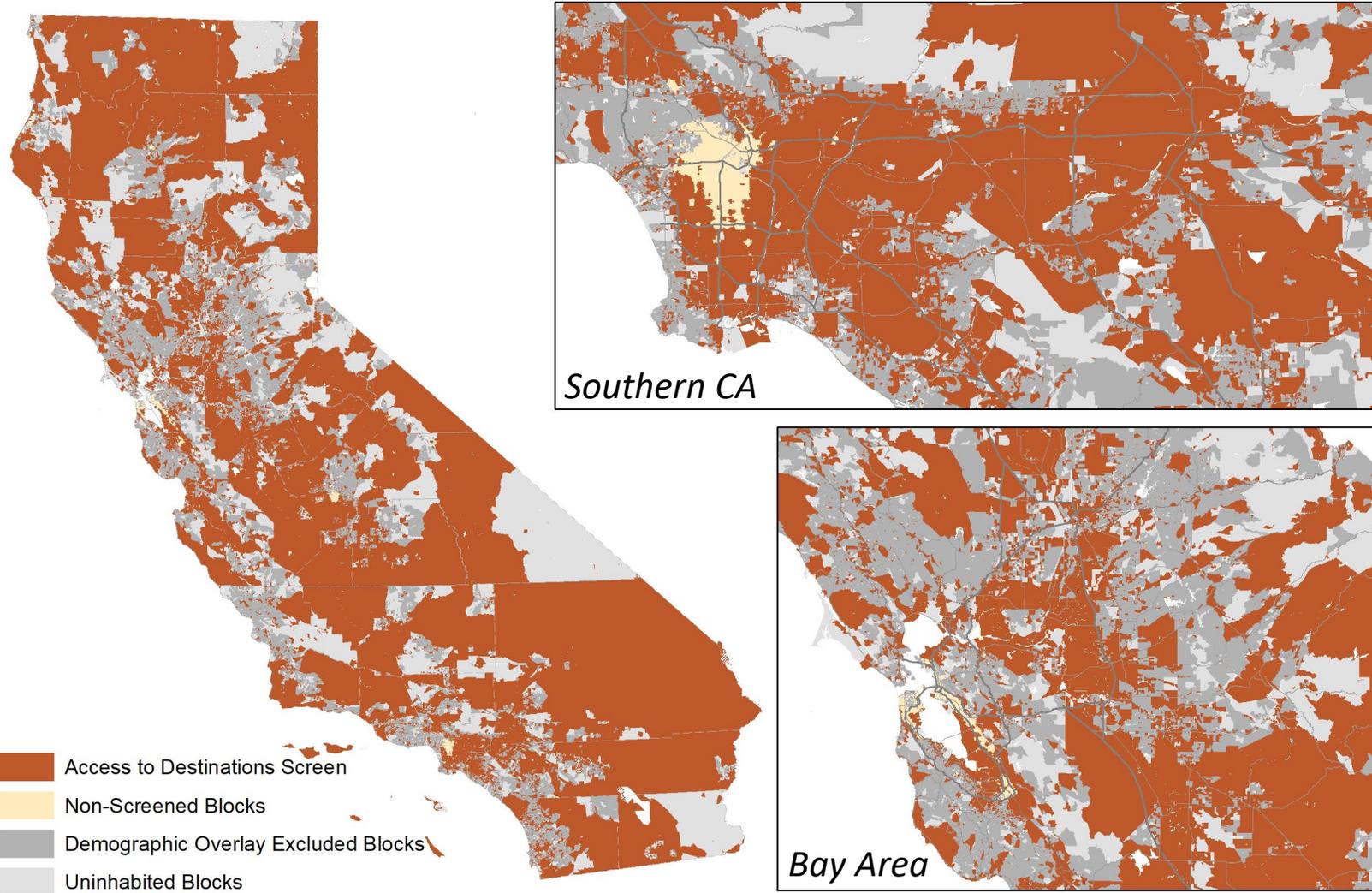
Traffic Exposure Screen

Total Population Coverage: **26%**



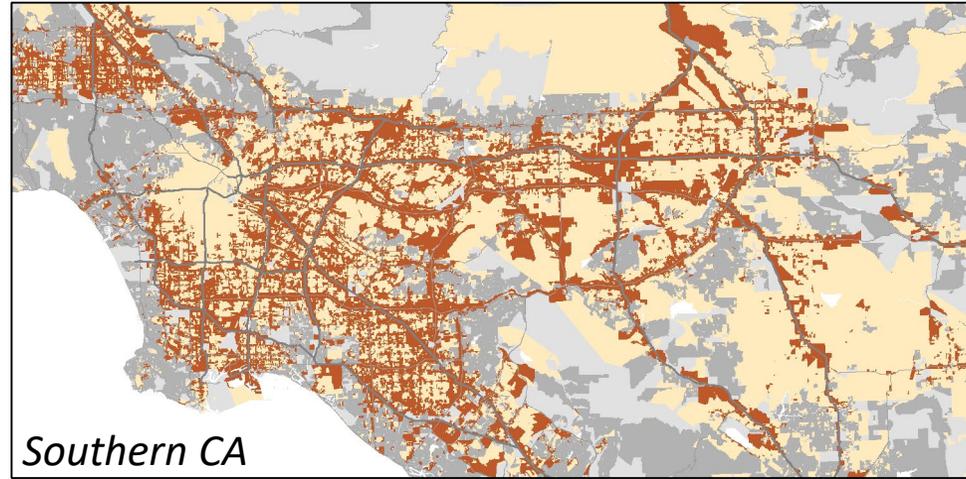
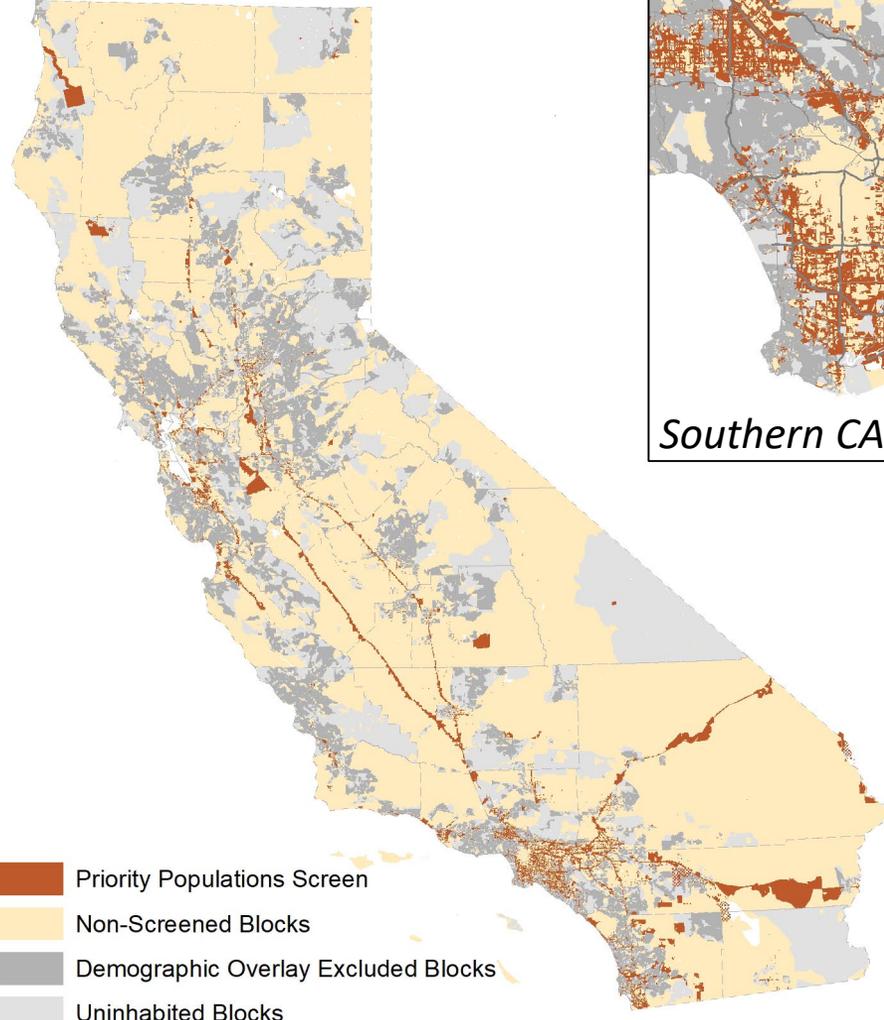
Access to Destinations Screen

Total Population Coverage: **61%**

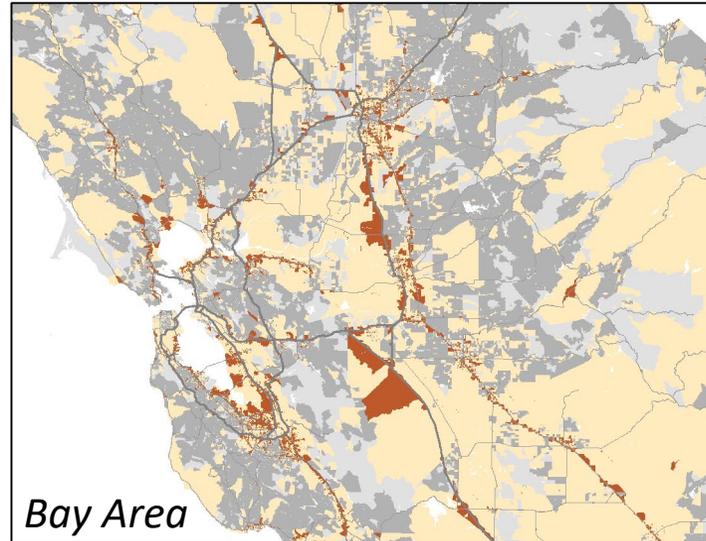


Priority Populations Screen

Total Population Coverage: **20%**



Southern CA



Bay Area

-  Priority Populations Screen
-  Non-Screened Blocks
-  Demographic Overlay Excluded Blocks
-  Uninhabited Blocks



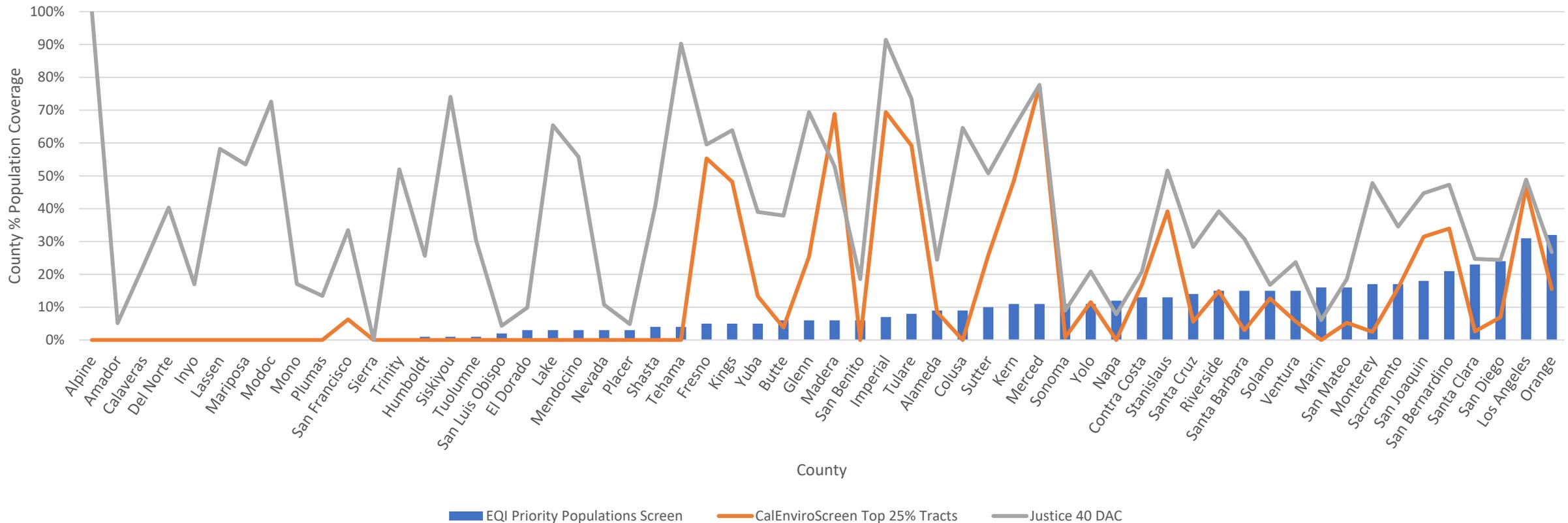
COMPARING EQUITY MAPPING TOOLS

	OEHHA: CalEnviroScreen	CEQ: CEJST (J40)	Caltrans: EQI
Transportation burdens	AADT, diesel exposure	AADT, diesel exposure	Weighted AADT, severe crashes
Transportation benefits	Not included	Time and dollar cost of travel	Non-auto access to work, non-auto access to non-work destinations
Demographics	Age, race, income, housing burden, employment, health, education	Income	Income, race/ethnicity
Unit of analysis	Census tract	Census tract	Census block

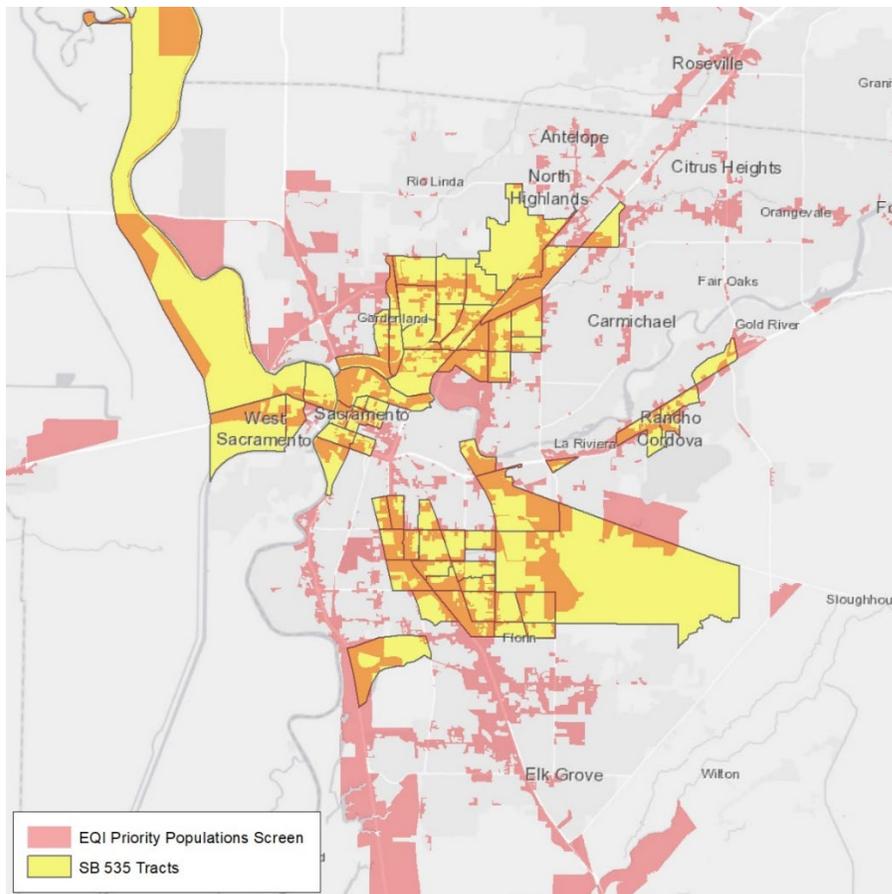
COVERAGE COMPARISON OF EQUITY MAPPING TOOLS



Coverage Comparison of Equity Screening Tools



COVERAGE COMPARISON OF EQUITY MAPPING TOOLS



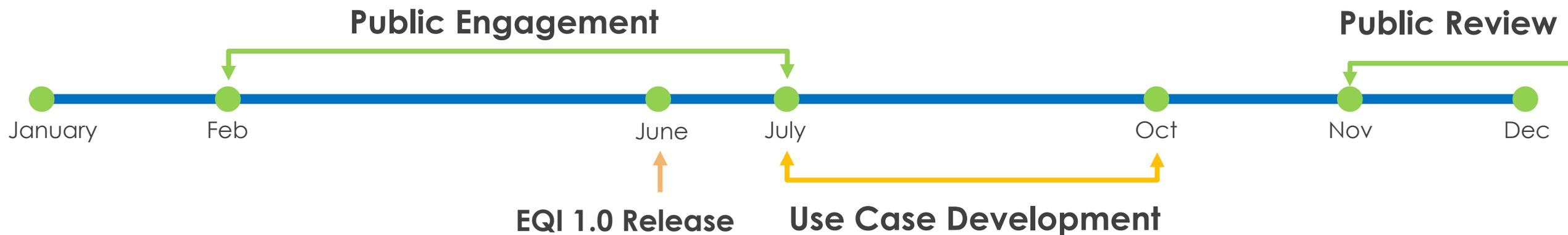
- Granularity of Census blocks
- Difference in project analysis methods

TRACKING

- Version 1.0 will be released in 2023 and updated annually
- Since percentile thresholds are used for the traffic exposure indicators, ~20% of blocks will be screened, regardless of relative improvements
- Tool will track relative improvements as well as absolute improvements

PUBLIC ENGAGEMENT PLAN

Timeline Overview - 2023



PUBLIC ENGAGEMENT PLAN

Information Sessions

- Session #1 – Introduction to beta EQI
- Session #2 – Update on beta EQI developments
- Session #3 – EQI methodology and technical development
- Session #4 – Presentation of draft use case scenarios
- Session #5 – Utilization of EQI 1.0



QUESTIONS?

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For more information:

[EQI Web Map](#) | [EQI Website](#) | [GitHub](#) | CaltransEQI@dot.ca.gov